

Tank Retrieval Technologies



U.S. Department of Energy
Office of Environmental Management
Office of Science and Technology

P roblem:

There are over 273 tanks in the U.S. Department of Energy complex. All of these tanks must be closed in accordance with federal and state regulations. The wastes include liquids, saltcake (a concrete-like crystalline solid), sludges (a thick suspension of solids), and miscellaneous debris (pieces of metal, concrete, etc.). This waste must be retrieved to close the tanks. Access to these tanks is through vertical pipes called risers. Internal tank structures complicate in-tank operations. Retrieval and transfer activities cannot plug transfer piping and must not add any excess water to the systems. Each waste type and tank configuration represents a retrieval challenge.

S olutions:

The U.S. Department of Energy's Tanks Focus Area (TFA) along with the Department's Offices of Waste Management and Environmental Restoration are developing, and deploying, technology systems to solve the tank waste retrieval problem. Some examples include:

Borehole Miner

AEA Fluidic Pulse Jet Mixer

Flygt Mixer

Gunite and Associated Tanks (GAAT) Retrieval System

B enefits:

TFA develops technologies for complex-wide applicability - maximizing the return on investment. These technologies represent technology solutions designed for applicability at the Oak Ridge Reservation, Hanford Site, and Savannah River Site. These technologies:

- ▶ Retrieve sludges and liquids from small tanks with restricted access
- ▶ Result in significant cost savings
- ▶ Mix waste more reliably
- ▶ Use existing in-tank piping
- ▶ Decrease risk
- ▶ Accelerate cleanup schedules
- ▶ Provide capabilities necessary for cleanup

B orehole Miner

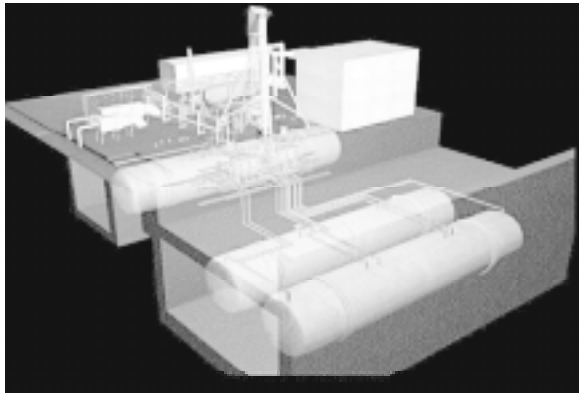
OST Reference #1499

At the Oak Ridge Reservation's Old Hydrofracture Facility, the Borehole Miner retrieved wastes from four tanks with restricted access. The system uses an extendible nozzle to dislodge and mobilize tank waste for removal by an in-tank retrieval pump. The water jet can produce pressures from 500 to 3,000 pounds per square inch with flow rates of 20 to 200 gallons per minute. The nozzle can be remotely extended and angled from a horizontal to near vertical position and can be rotated about the mast, enabling thorough cleaning of the tank surfaces.

Benefits:

- ▶ Allows for mobilization of sludge from a single riser
- ▶ Applicable to limited-access tanks
- ▶ Requires less water than past practice sluicing





AEA Fluidic Pulse Jet Mixer

OST Reference #1511

At the Oak Ridge Reservation's Bethel Valley Evaporator Service Tanks, the AEA Fluidic Pulse Jet Mixer mobilized radioactive sludge and liquids. Nozzles in the tank are coupled to air ejectors through a charge tank. The air ejectors apply suction, filling the charge tank with waste. Next, air is applied to the charge tank, forcing the waste back through the nozzles to mix the tank's contents. The cycle repeats until the resulting slurry is suitable for pumping.

Benefits:

- ▶ Suitable for tanks with flammable gases
- ▶ No in-tank moving parts; reduced maintenance
- ▶ Reduced infrastructure costs
- ▶ Suitable for tanks with interior structures

Flygt Mixer

OST Reference #2232

The Flygt Mixer rapidly mixes large quantities of tank waste. The Flygt Mixer uses an open propeller to create long-range currents that mix thousands of gallons per minute. Flygt Mixers are smaller than conventional mixer pumps; allowing deployment in more risers. The Tanks Focus Area's test program developed mixer sizing and configuration data, recommended operating practices for full-scale waste tanks, and developed a deployment mast.

Benefits:

- ▶ Less expensive than conventional mixer pumps
- ▶ Lower disposal costs
- ▶ Smaller size results in increased applicability



GAAT Retrieval

OST Reference #85, 812, 98, 890, 810

In its third year of use, the GAAT Retrieval System continues to clean tanks at the Oak Ridge Reservation. The system includes the Modified Light-Duty Utility Arm (MLDUA), Confined Sluicing End Effector (CSEE), and HOUDINI vehicle. The HOUDINI vehicle was developed in conjunction with the Robotics Crosscutting Focus Area and Industry Programs.

Benefits:

- ▶ Significant life cycle cost savings
- ▶ Capability to meet compliance agreements
- ▶ Reduced worker exposure
- ▶ Provides capability necessary for cleanup

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